

# A METHOD FOR EXTRACTING MERIDIONAL WINDS FROM IONOSONDE MEASUREMENTS BY USING IONOSPHERIC MODELS

P. G. Richards and D. G. Torr  
Center for Atmospheric and Space Sciences  
Utah State University, UMC 34  
Logan, UT 84322

There has been great progress in modelling and measuring the dynamics of the neutral upper atmosphere in recent years [Hernandez and Roble, 1984a, b]. However, future progress will depend on the availability of global measurements of neutral winds.

At present, neutral winds can be deduced from the ion velocities measured by incoherent scatter radar and also by Fabry-Perot monitoring of the doppler shifted red line of atomic oxygen. Neither of the above methods can be relied on to provide adequate global coverage because radars are expensive to build and operate and Fabry-Perot measurements are restricted to clear skies and nighttime.

The purpose of this paper is to draw attention to a relatively cheap means of supplementing the data base of neutral winds provided by the radar and optical measurements with data obtained by ionosondes.

Rishbeth [1972] in his review of F-region dynamics, derived the relationship between the height of the F2 layer and the component of the neutral wind parallel to the magnetic field of the Earth. In this paper, we examine the sensitivity of the height and density of the F2 layer over Boulder, Colorado on 30 July 1982 to changes in meridional wind speed using a comprehensive interhemispheric numerical model [Richards and Torr, 1985] that solves the continuity and momentum equations for  $H^+$  and  $O^+$ , the energy equations for  $Te$  and  $Ti$ , and the 2-stream photoelectron equations to obtain electron heating rates. For the neutral atmosphere temperature and densities, we have used MSIS-83 model of Hedin [1983].

## REFERENCES

- Hedin, A. E., A revised thermospheric model based on mass spectrometer and incoherent scatter data: MSIS-83, *J. Geophys. Res.*, 88, 10170-10188, 1983.
- Hernandez, G., and R. G. Roble, The geomagnetic quiet nighttime thermospheric wind pattern over Fritz Peak Observatory during solar cycle minimum and maximum., *J. Geophys. Res.*, 89, 327-337, 1984a.
- Hernandez, G., and R. G. Roble, Nighttime variation of thermospheric winds and temperatures over Fritz Peak Observatory during the geomagnetic storm of March 2, 1983, *J. Geophys. Res.*, 89, 9049-9056, 1984b.
- Rishbeth, H., Thermospheric winds and the F-region: A review, *J. Atmos. Terr. Phys.*, 34, 1-47, 1972.

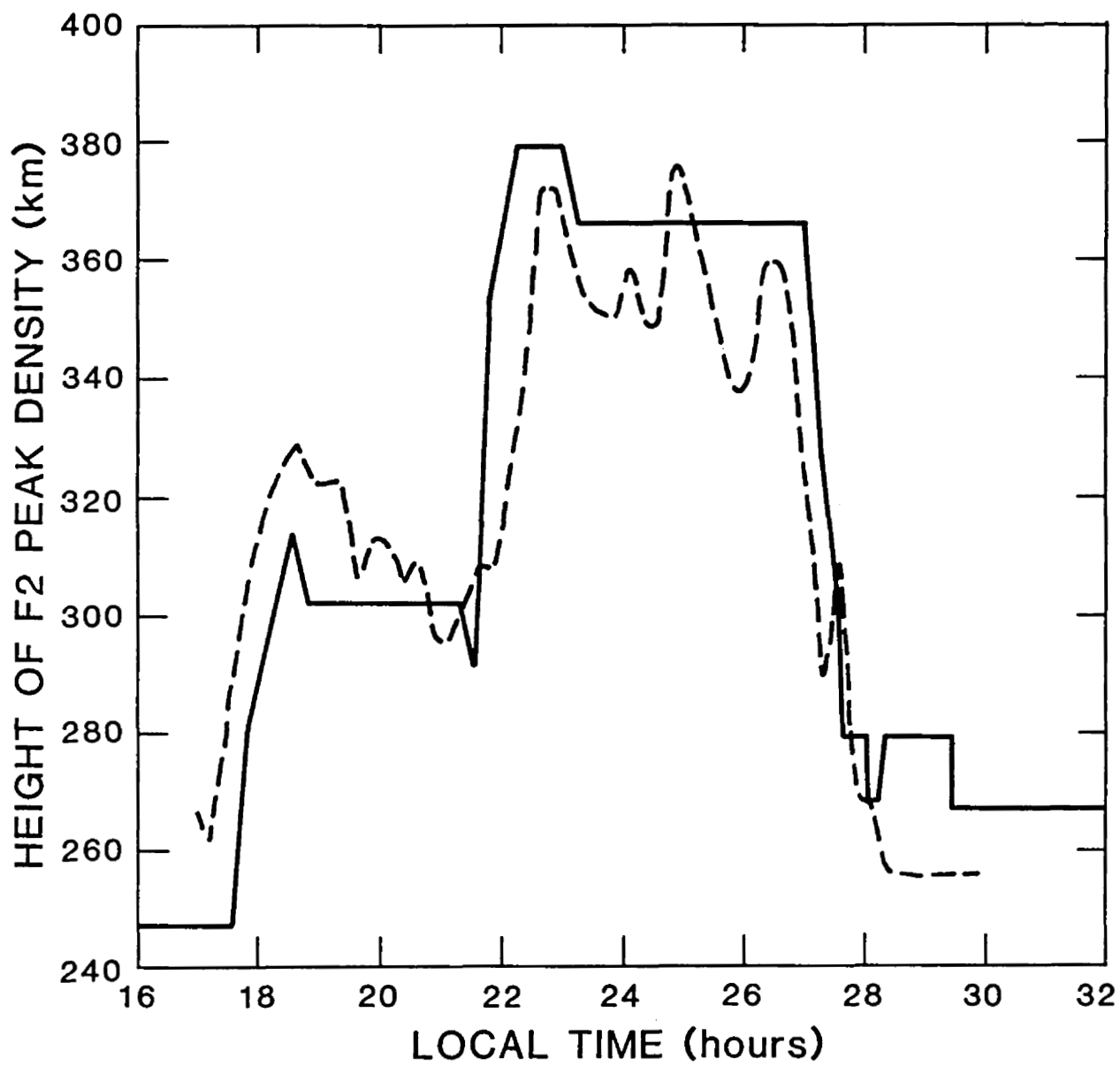


Figure 1. Variation in the height of the F2 layer over Boulder Colorado on 30 July 1982 (broken line) compared with the model calculation (full line).

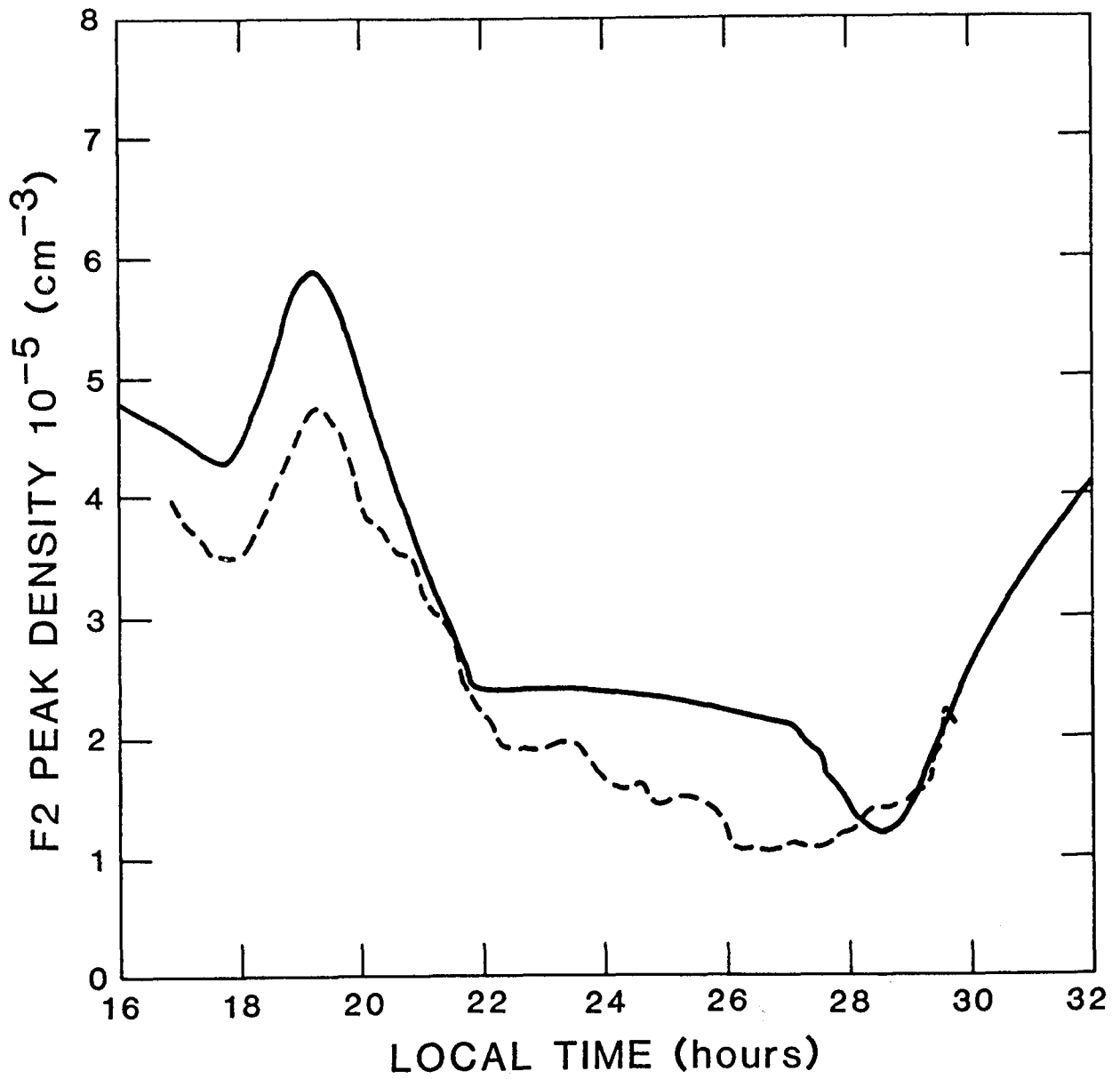


Figure 2. Observed (broken line) and calculated (full line) electron density variations corresponding to the conditions of Figure 1.

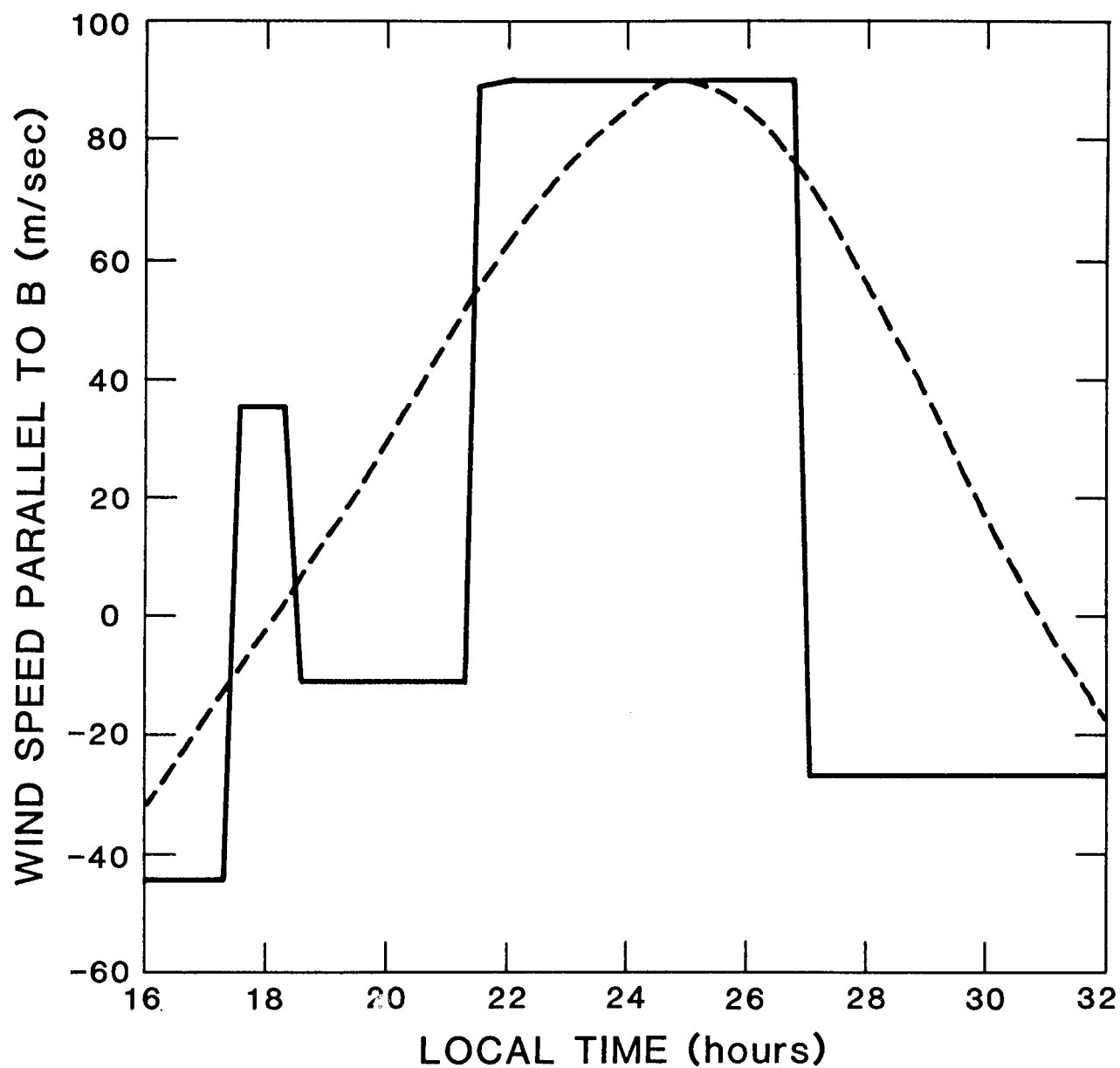


Figure 3. The full line represents the wind variation used to obtain the model results of Figures 1 and 2. The broken curve is the wind variation used to obtain the model results in Figures 4 and 5.

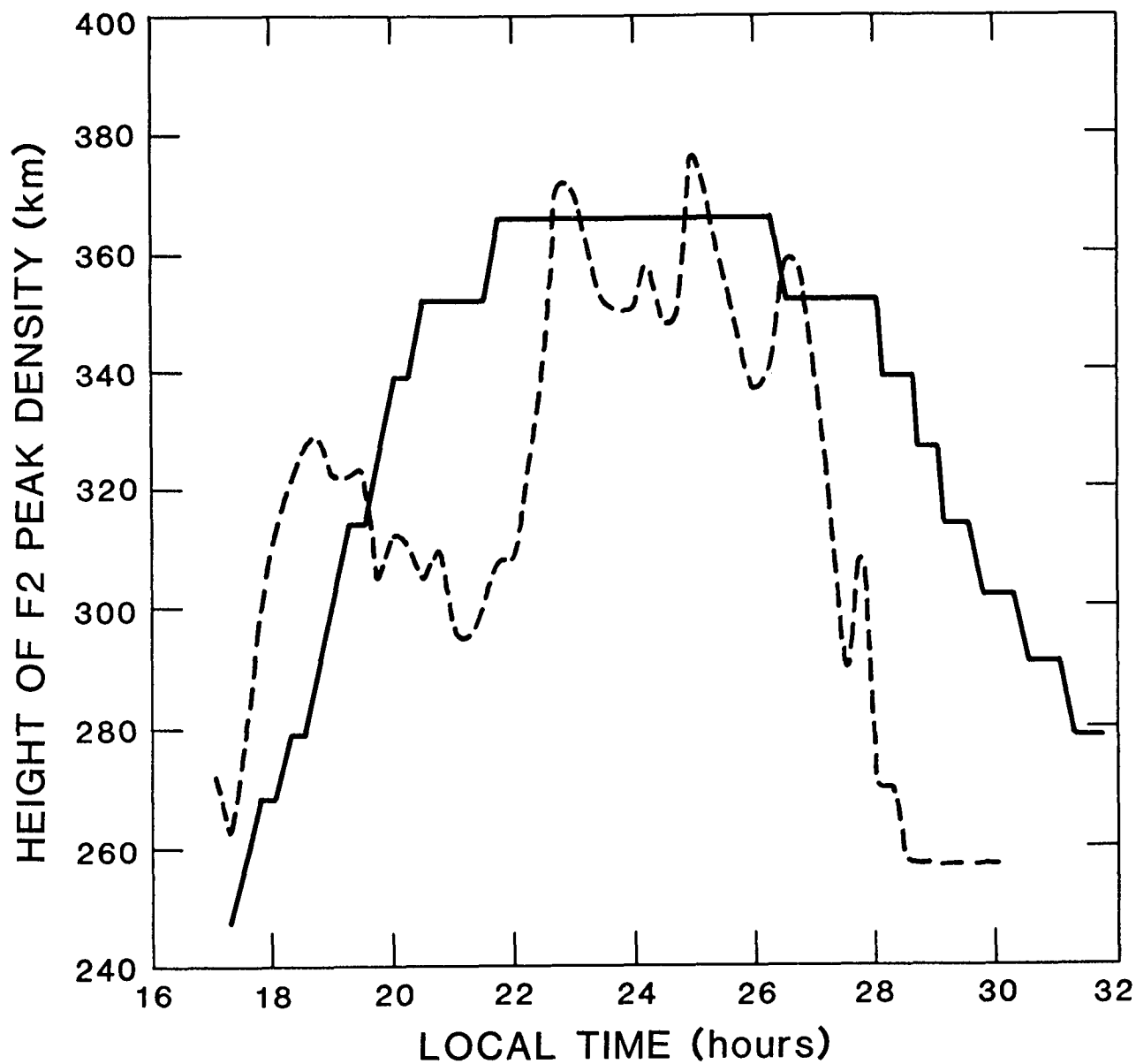


Figure 4. Variation in the height of the F2 layer over Boulder Colorado on 30 July 1982 (broken line) compared with the model calculation (full line) using the wind variation depicted by the broken line in Figure 3.

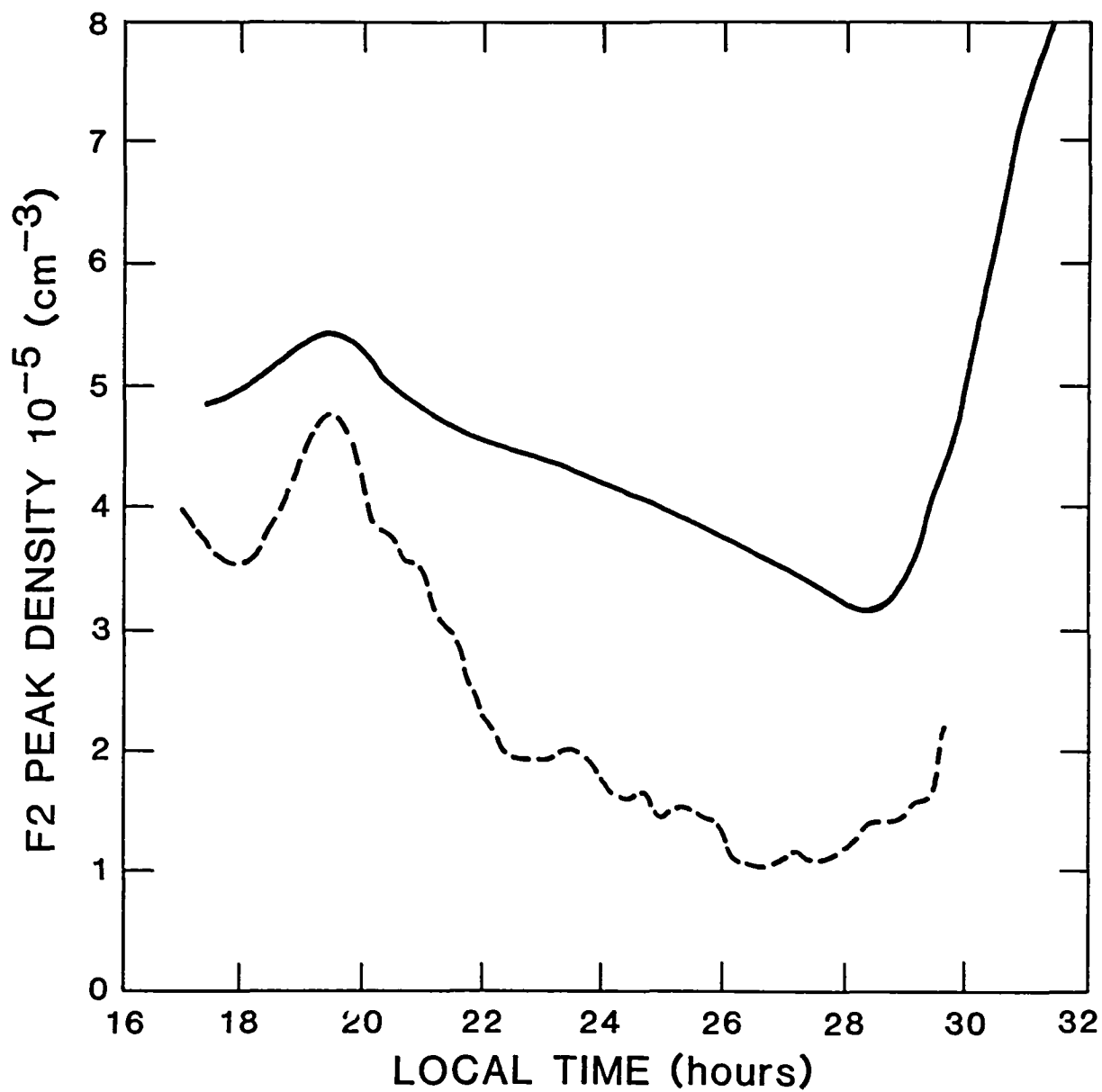


Figure 5. Observed (broken line) and calculated (full line) electron density variations using the wind variation depicted by the broken line in Figure 3.